STF140N6F7, STH140N6F7-2, STP140N6F7

N-channel 60 V, 0.0025 Ω typ., 80 A, STripFET™ VII DeepGATE™ Power MOSFETs in TO-220FP, H²PAK-2 and TO-220 packages

Datasheet - target specification

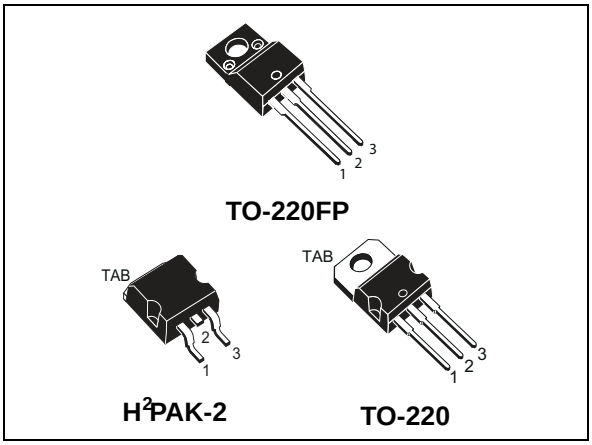
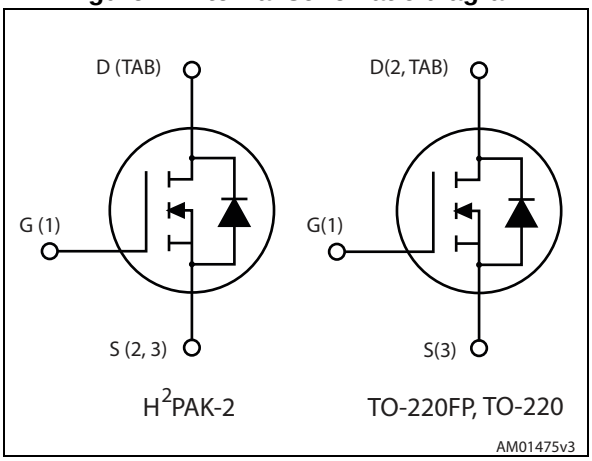


Figure 1. Internal schematic diagram



Features

Order codes	V_{DS}	$R_{DS(on)max}$	I_D	P_{TOT}
STF140N6F7	60 V	0.003 Ω	72 A	30 W
STH140N6F7-2			80 A	110 W
STP140N6F7				

- 100% avalanche tested
- Ultra low on-resistance

Applications

- Switching applications

Description

These devices utilize the 7th generation of design rules of ST's proprietary STripFET™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest $R_{DS(on)}$ in all packages.

Table 1. Device summary

Order codes	Marking	Package	Packaging
STF140N6F7	140N6F7	TO-220FP	Tube
STH140N6F7-2		H²PAK-2	Tape and reel
STP140N6F7		TO-220	Tube

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220FP	H^2PAK, TO-220	
V_{DS}	Drain-source voltage	60		V
V_{GS}	Gate- source voltage	±20		V
I_D (1)	Drain current (continuous)	72	80	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	52	80	A
I_{DM} (2)	Drain current (pulsed) T_C = 25 °C	288	320	A
P_{TOT}	Total dissipation at T_C = 25 °C	30	110	W
T_J	Operating junction temperature	-55 to 175	-55 to 175	°C
T_{stg}	Storage temperature			°C

1. Current limited by package.
2. Pulse width is limited by safe operating area

Table 3. Thermal data

Symbol	Parameter	Value			Unit
		TO-220FP	H^2PAK	TO-220	
$R_{thj\text{-}pcb}$ (1)	Thermal resistance junction-pcb max		35		°C/W
$R_{thj\text{-}case}$	Thermal resistance junction-case max	5	1.36		°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient max	62.5		62.5	°C/W

1. When mounted on 1 inch² FR-4 board, 2 oz Cu

2 Electrical characteristics

(T_C = 25 °C unless otherwise specified)

Table 4. On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0, I_D = 250 µA	60			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0, V_{DS} = 60 V			1	µA
		V_{GS} = 0, V_{DS} = 60 V, T_C=125 °C			100	µA
I_{GSS}	Gate-body leakage current	V_{DS} = 0, V_{GS} = +20 V			100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 40 A		0.0025	0.003	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} =25 V, f = 1 MHz, V_{GS} = 0	-	2700	-	pF
C_{oss}	Output capacitance		-	650	-	pF
C_{rss}	Reverse transfer capacitance		-	25	-	pF
Q_g	Total gate charge	V_{DD} = 30 V, I_D = 80 A, V_{GS} = 10 V (see *Figure 3*)	-	40	-	nC
Q_{gs}	Gate-source charge		-	TBD	-	nC
Q_{gd}	Gate-drain charge		-	TBD	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 30 V, I_D = 40 A, R_G = 4.7 Ω, V_{GS} = 10 V (see *Figure 2*)	-	TBD	-	ns
t_r	Rise time		-	TBD	-	ns
$t_{d(off)}$	Turn-off delay time		-	TBD	-	ns
t_f	Fall time		-	TBD	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-	-	80	A
I_{SDM} (1)	Source-drain current (pulsed)		-	-	320	A
V_{SD} (2)	Forward on voltage	I_{SD} = 80 A, V_{GS} = 0	-	-	TBD	V
t_{rr}	Reverse recovery time	I_{SD} = 80 A, di/dt = 100 A/µs V_{DD} = 48 V, T_J=150 °C (see *Figure 4*)	-	-		ns
Q_{rr}	Reverse recovery charge		-	-		nC
I_{RRM}	Reverse recovery current		-	-		A

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration = 300 µs, duty cycle 1.5%.

3 Test circuits

Figure 2. Switching times test circuit for resistive load

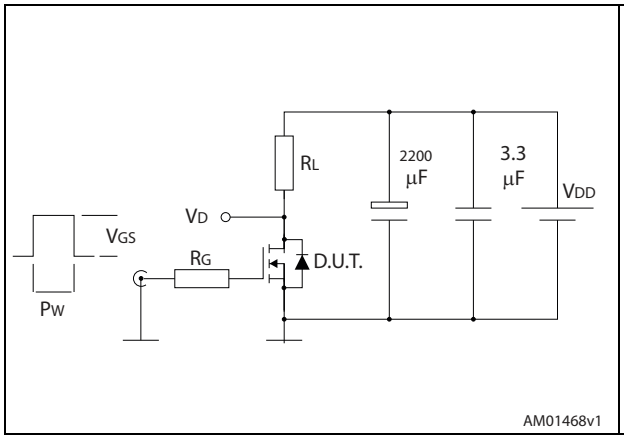


Figure 3. Gate charge test circuit

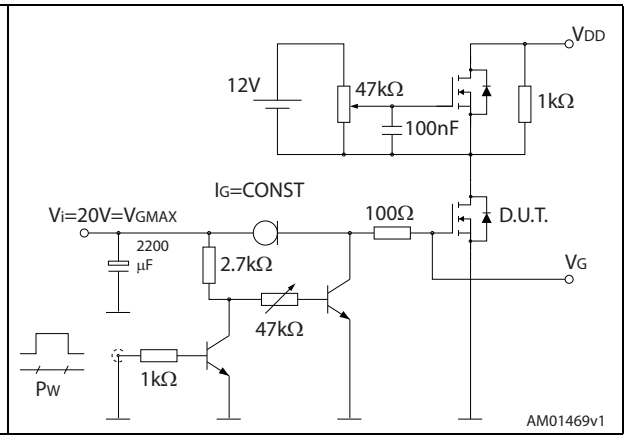


Figure 4. Test circuit for inductive load switching and diode recovery times

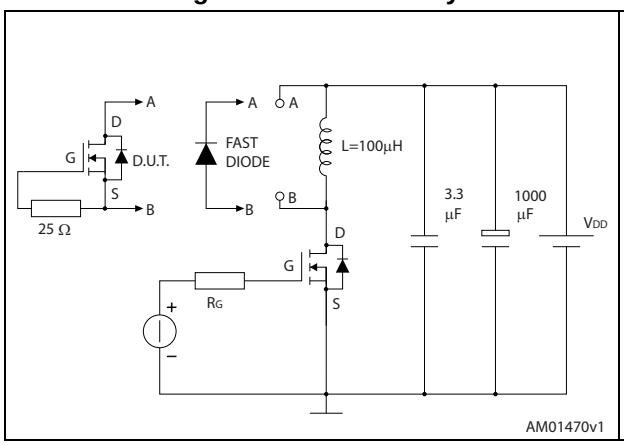


Figure 5. Unclamped inductive load test circuit

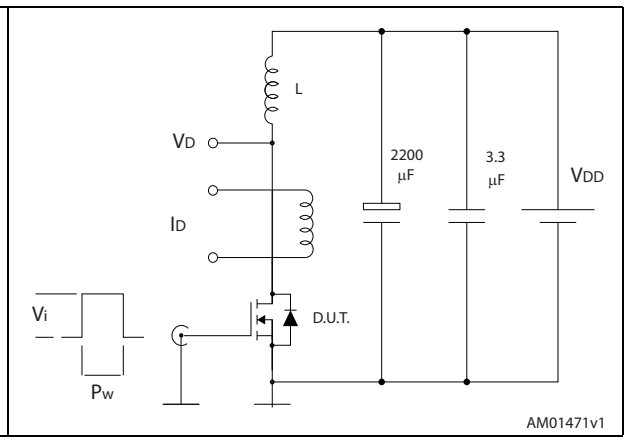


Figure 6. Unclamped inductive waveform

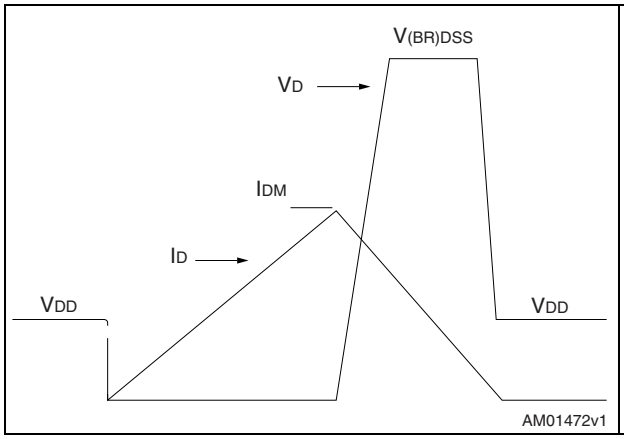
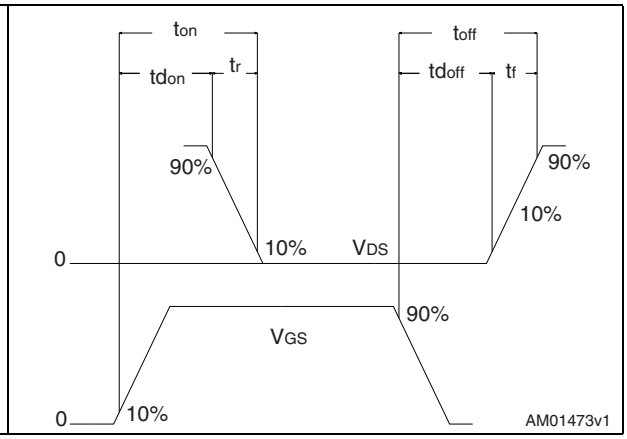


Figure 7. Switching time waveform



4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK® is an ST trademark.

Table 8. TO-220FP mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.4		4.6
B	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.2
G1	2.4		2.7
H	10		10.4
L2		16	
L3	28.6		30.6
L4	9.8		10.6
L5	2.9		3.6
L6	15.9		16.4
L7	9		9.3
Dia	3		3.2

Figure 8. TO-220FP drawing

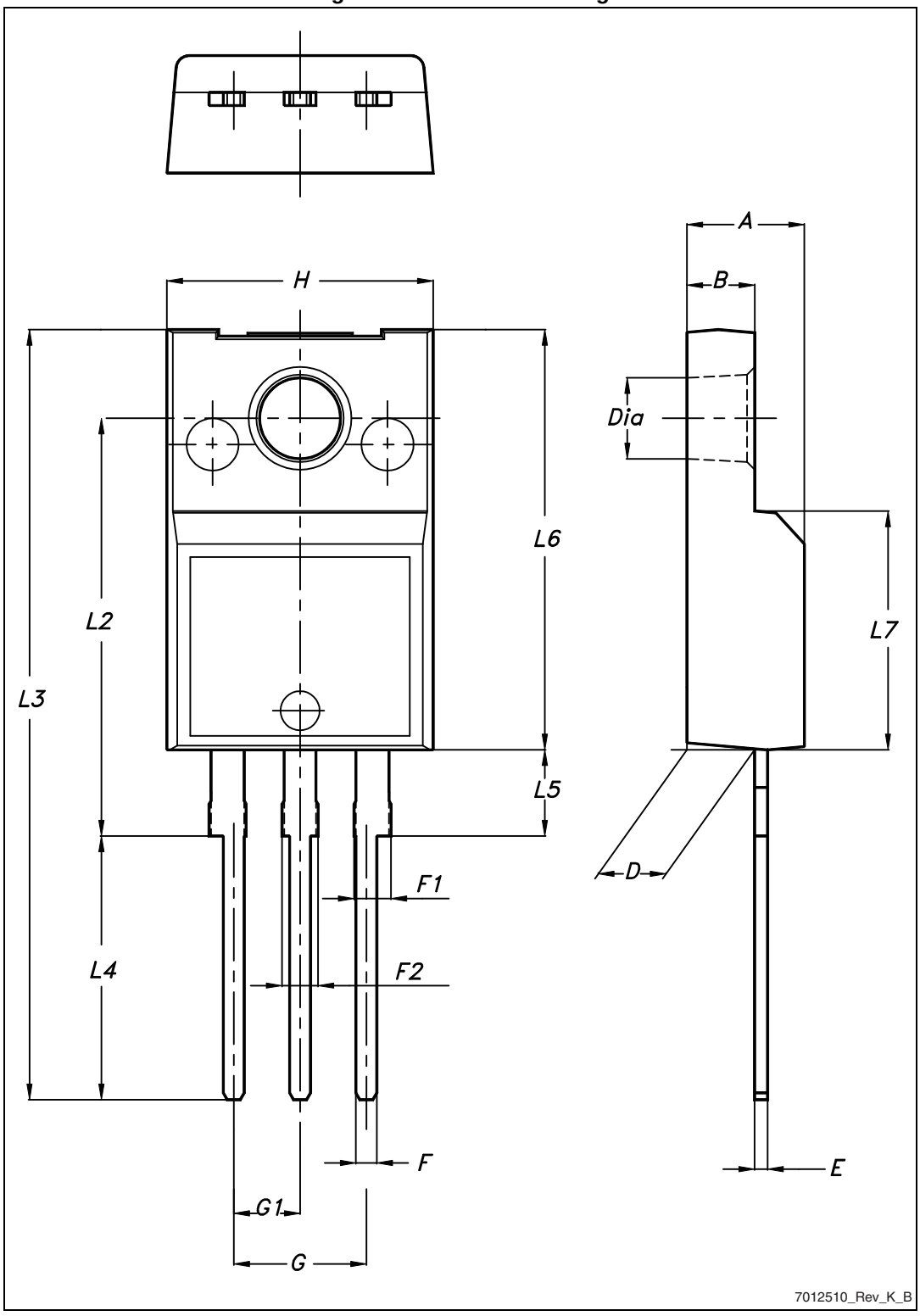


Table 9. H²PAK-2 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30	-	4.80
A1	0.03		0.20
C	1.17		1.37
e	4.98		5.18
E	0.50		0.90
F	0.78		0.85
H	10.00		10.40
H1	7.40		7.80
L	15.30		15.80
L1	1.27		1.40
L2	4.93		5.23
L3	6.85		7.25
L4	1.5		1.7
M	2.6		2.9
R	0.20		0.60
V	0°		8°

Figure 9. H²PAK-2 drawing

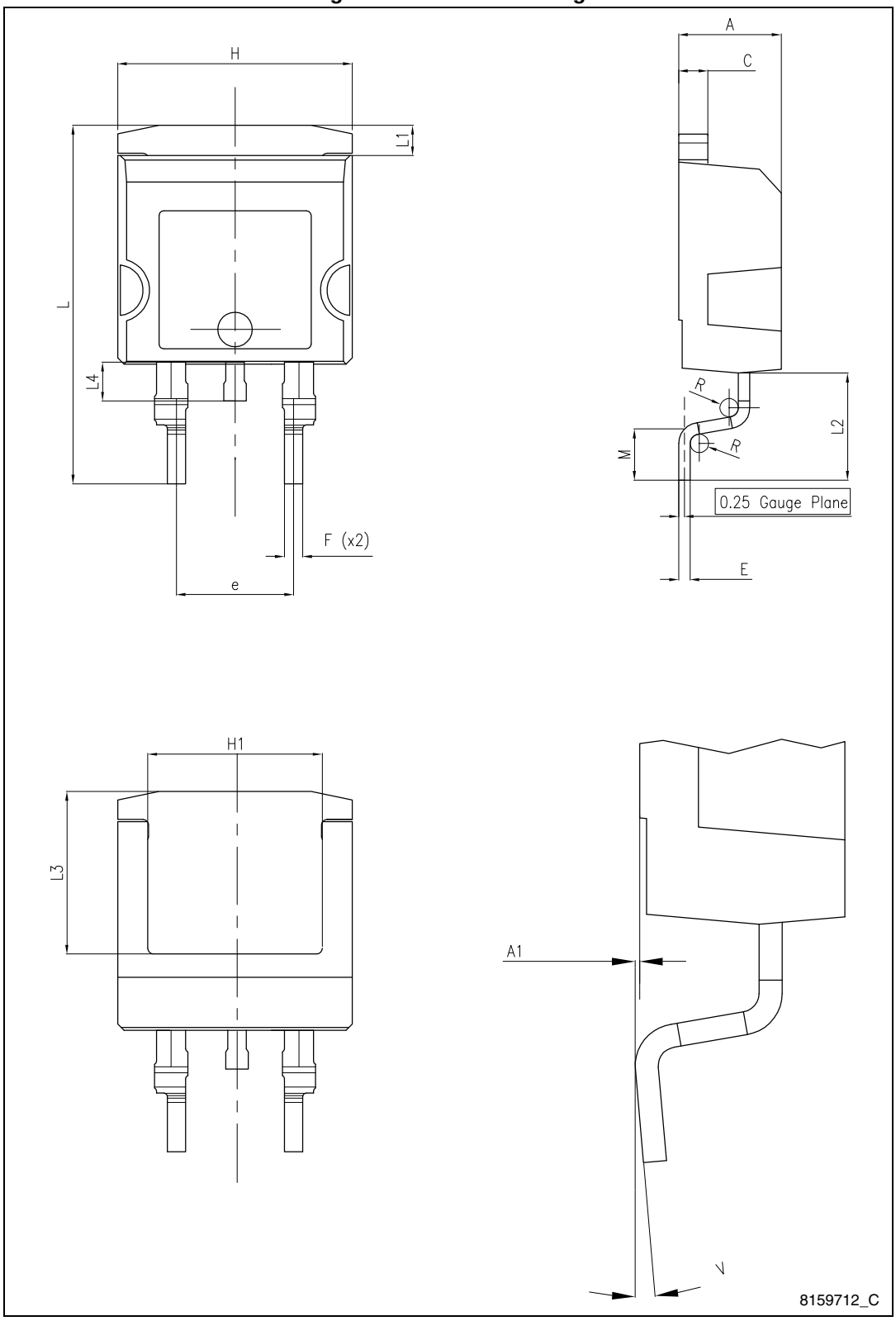


Figure 10. H²PAK-2 recommended footprint (dimensions are in mm)

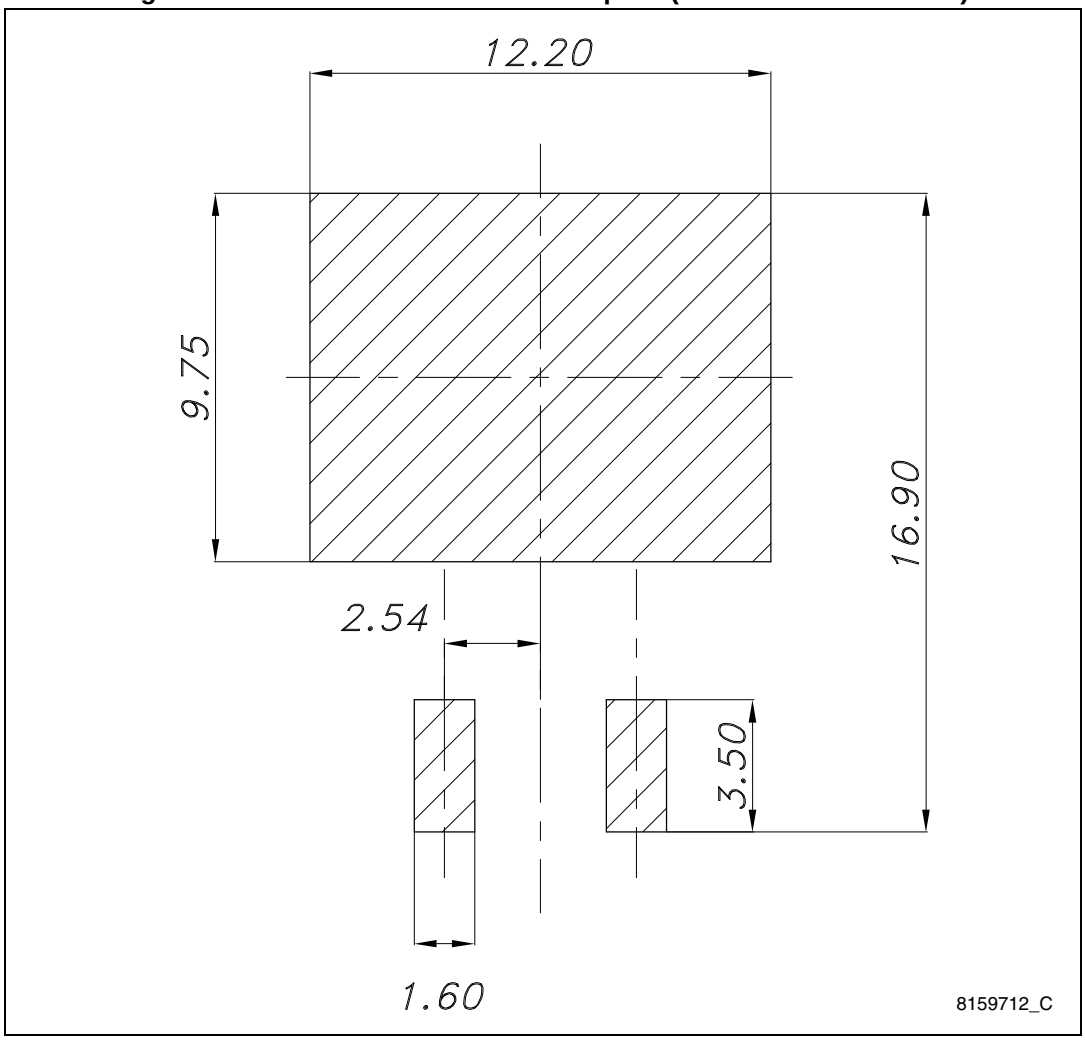
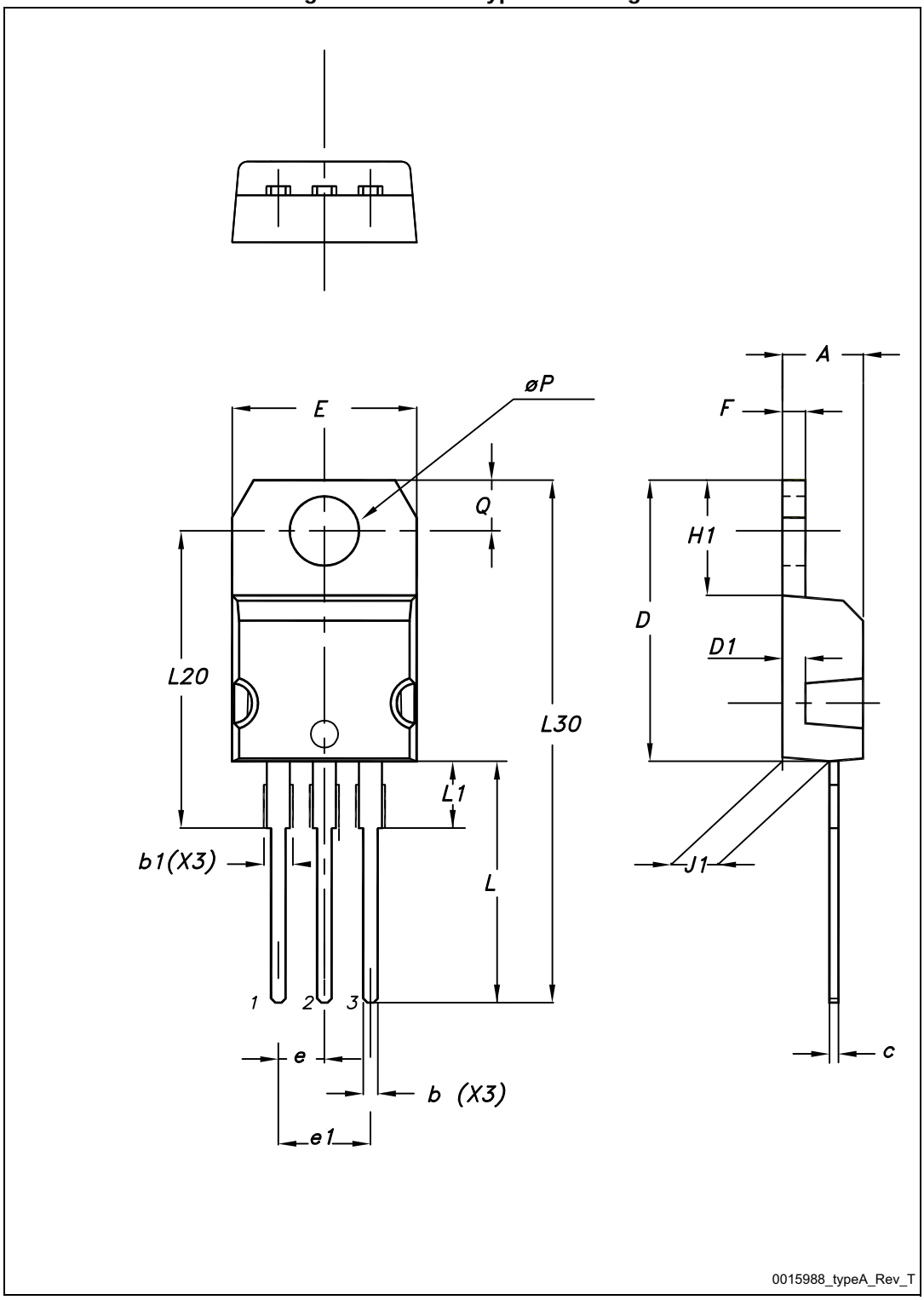


Table 10. TO-220 type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
∅P	3.75		3.85
Q	2.65		2.95

Figure 11. TO-220 type A drawing



5 Packaging mechanical data

Table 11. H²PAK-2 tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base qty		1000
P2	1.9	2.1	Bulk qty		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

Figure 12. Tape

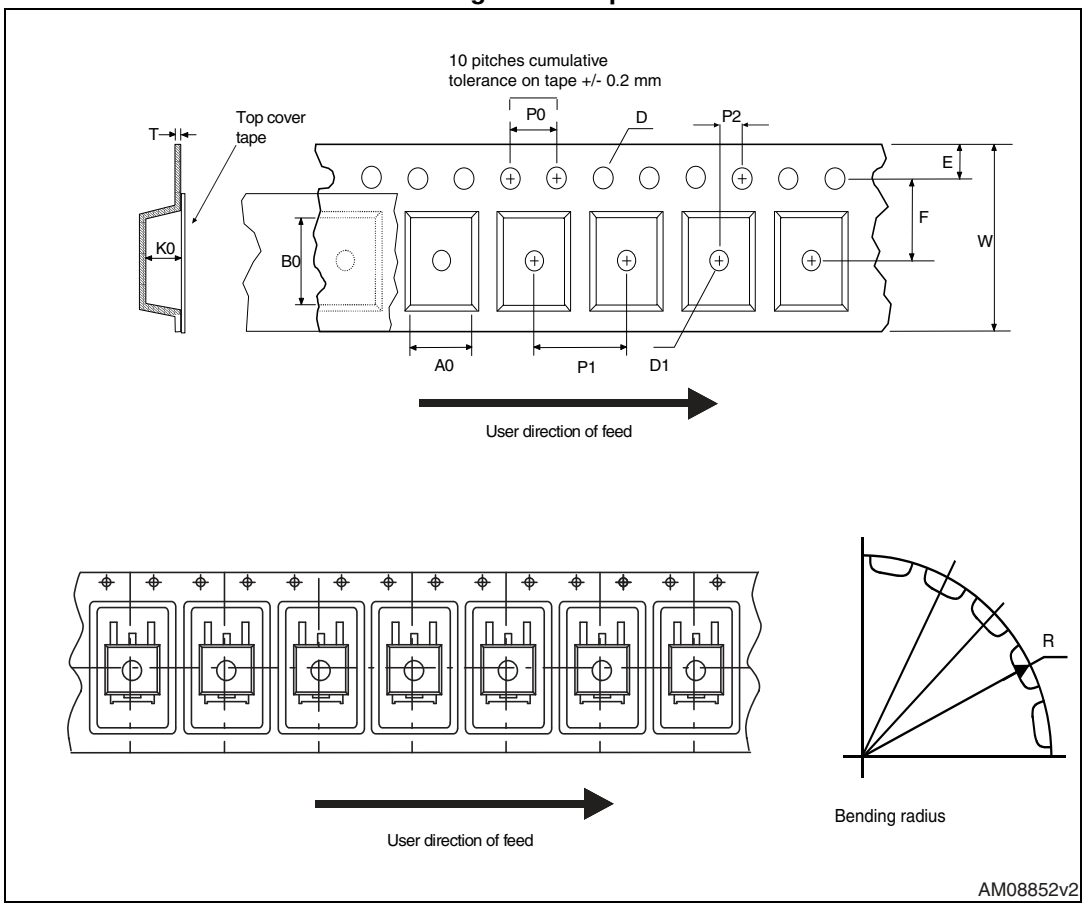
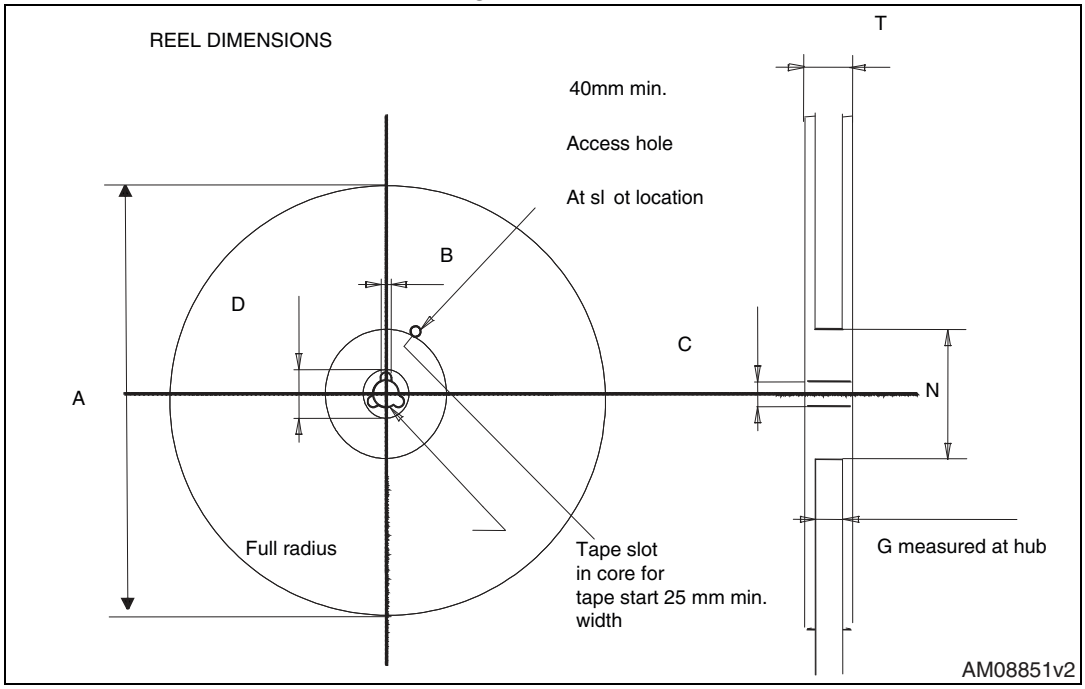


Figure 13. Reel



6 Revision history

Table 12. Document revision history

Date	Revision	Changes
02-Aug-2013	1	Initial release.

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